Prescott AMA Fourth Management Plan
DRAFT Working Copy

Groundwater Users Advisory Council

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Information sources reviewed:

- Safe-yield Subcommittee of the PRAMA GUAC, 2006 report "Final Report on Safe-yield Impediments"
- "Central Yavapai Highlands Water Resources Management Study Phase III – Water Supply Alternatives"
- Environmental Protection Agency – "WaterSense" plumbing fixtures
- City of Prescott Water Management Policy
- City of Prescott Designation of Assured Water Supply
- Town of Prescott Valley
- Town of Chino Valley
- Annual Water Withdrawal & Use Reports
- ADWR, Hydrology Modeling Section
- Demand and Supply Assessment, Prescott AMA
- Gary Woodard, University of Arizona

DRAFT Working Copy 4MP Chapters

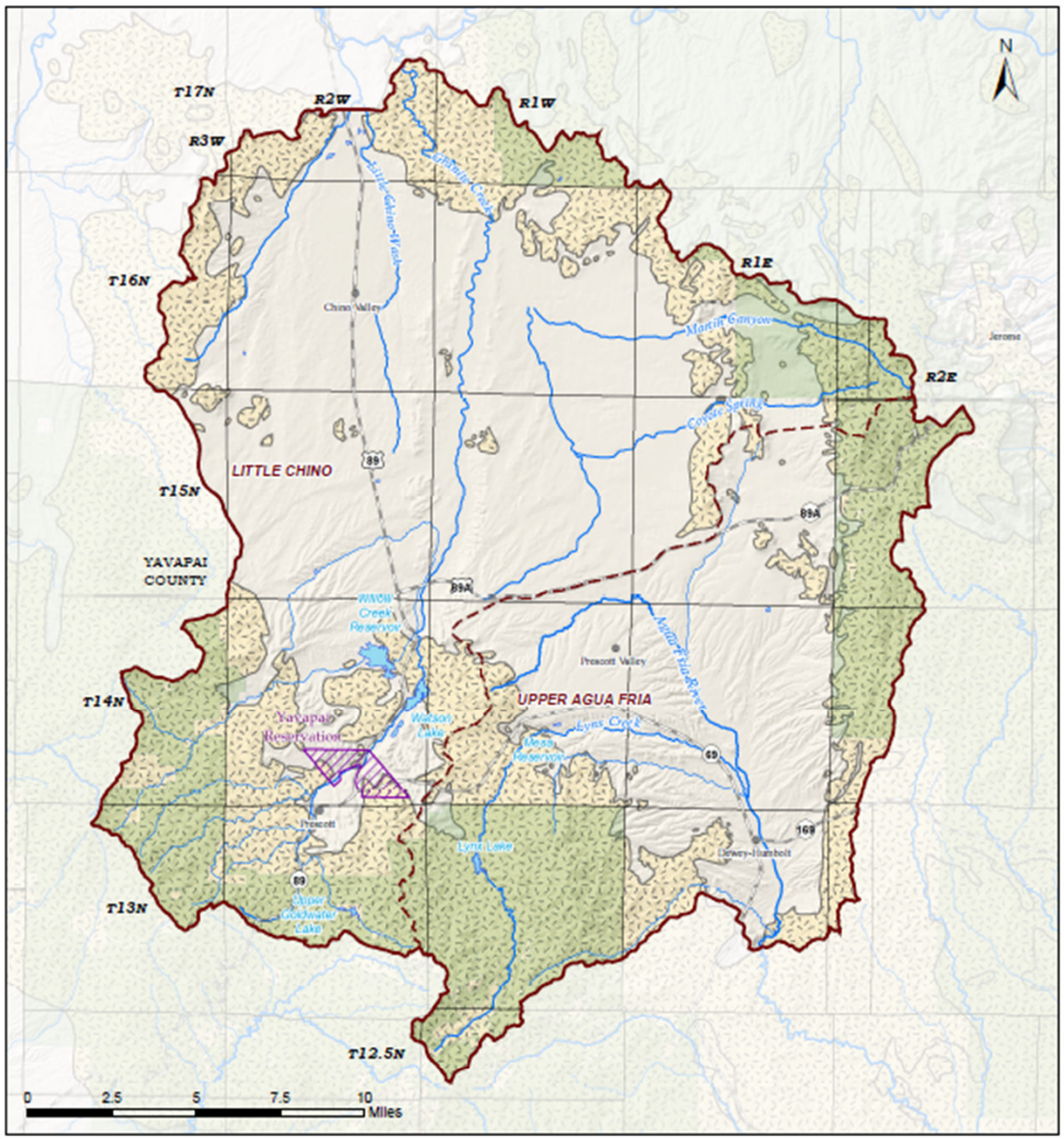
- Chapter 1 – INTRODUCTION
- Chapter 2 – HYDROLOGY
- Chapter 3 – WATER DEMANDS & SUPPLY
- Chapter 4 – AGRICULTURAL
- Chapter 5 – MUNICIPAL
- Chapter 6 – INDUSTRIAL
- Chapter 7 – WATER QUALITY
- Chapter 8 – AUGMENTATION & RECHARGE
- Chapter 9 – WATER MANAGEMENT ASSISTANCE
- Chapter 10 – IMPLEMENTATION
- Chapter 11 – BUDGETS
- Chapter 12 – WATER MANAGEMENT STRATEGY

Chapter 1: INTRODUCTION

- AMA Issues:
  - Physical availability of groundwater within the Prescott AMA (PRAMA)
  - Consistency with the AMA goal under the Assured Water Supply (AWS) Rules (limited extinguishments, how to meet?)
  - Financial capability under the AWS Rules - cost of Big Chino (BC) groundwater and other renewable alternatives
  - Limitations of the management plans – won't get AMA to Safe-Yield (SY)

Chapter 2: HYDROLOGY

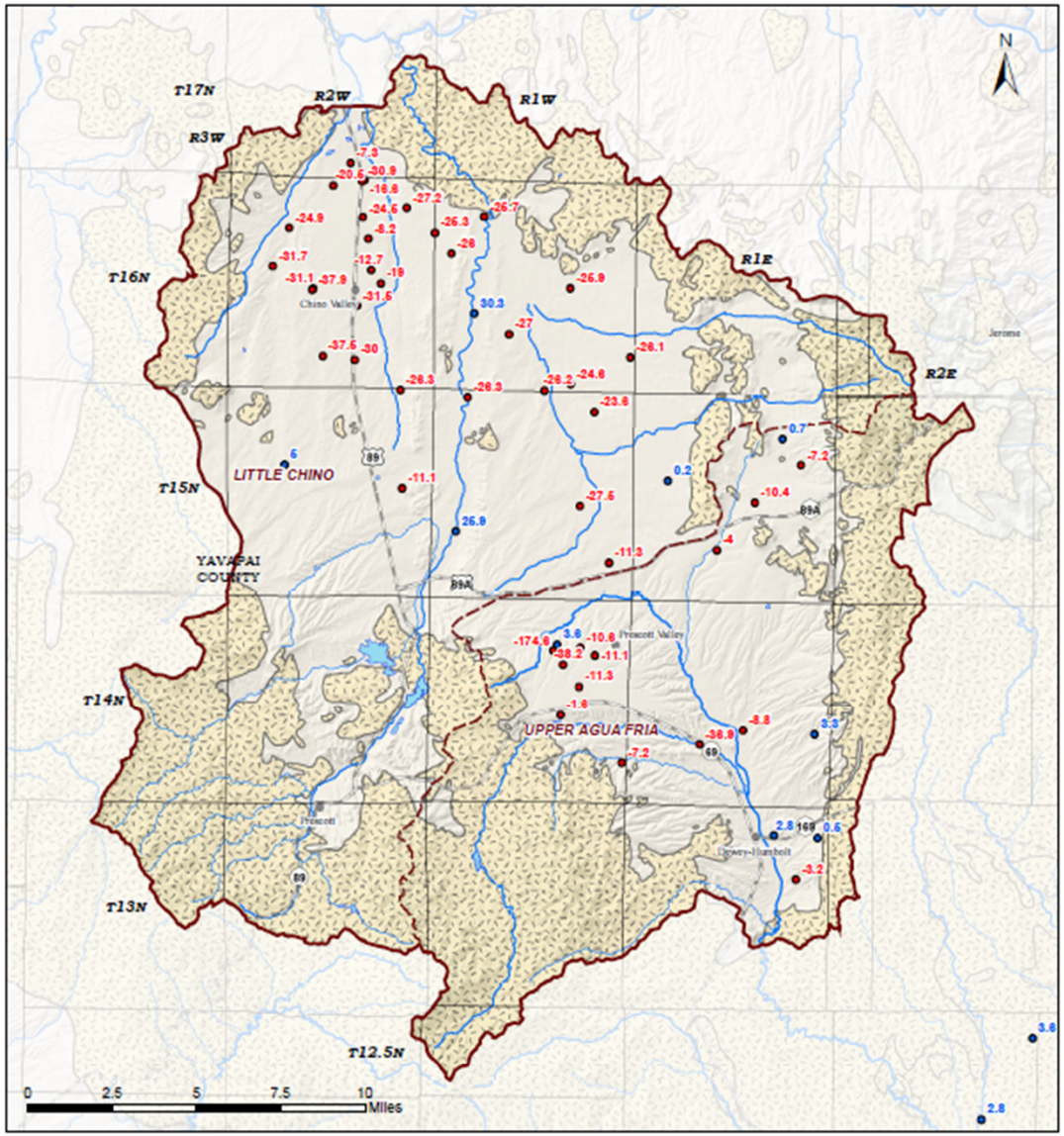
- Historically fluctuating annual precipitation amounts
- Prolonged drought since 1995
- Most natural recharge enters along the tributaries and is highly seasonal and sporadic
- Projected natural recharge for the Fourth Management Plan (4MP) budgets using extrapolated recharge and discharge rates and stream channel recharge (generated by the model):
  - Historical “dry” period (lower than average precipitation) - 1940-1953,
  - “Wet” period (higher than average precipitation) - 1973-1986, and
  - Average precipitation - 1963-1976 or 1994-2007
- Water level trends 1994-2010 generally down except along tributaries and near Underground Storage Facilities (USFs)
- Wells in PRAMA near tributaries respond rapidly to high stream channel flow – similar to wells near the Santa Cruz River in the Santa Cruz AMA



Prescott AMA

Legend

- Prescott AMA
- Sub-basin
- City or Town
- Major Road
- Lake
- Stream
- Hardrock
- Prescott National Forest
- State Boundary
- Township/Range
- County

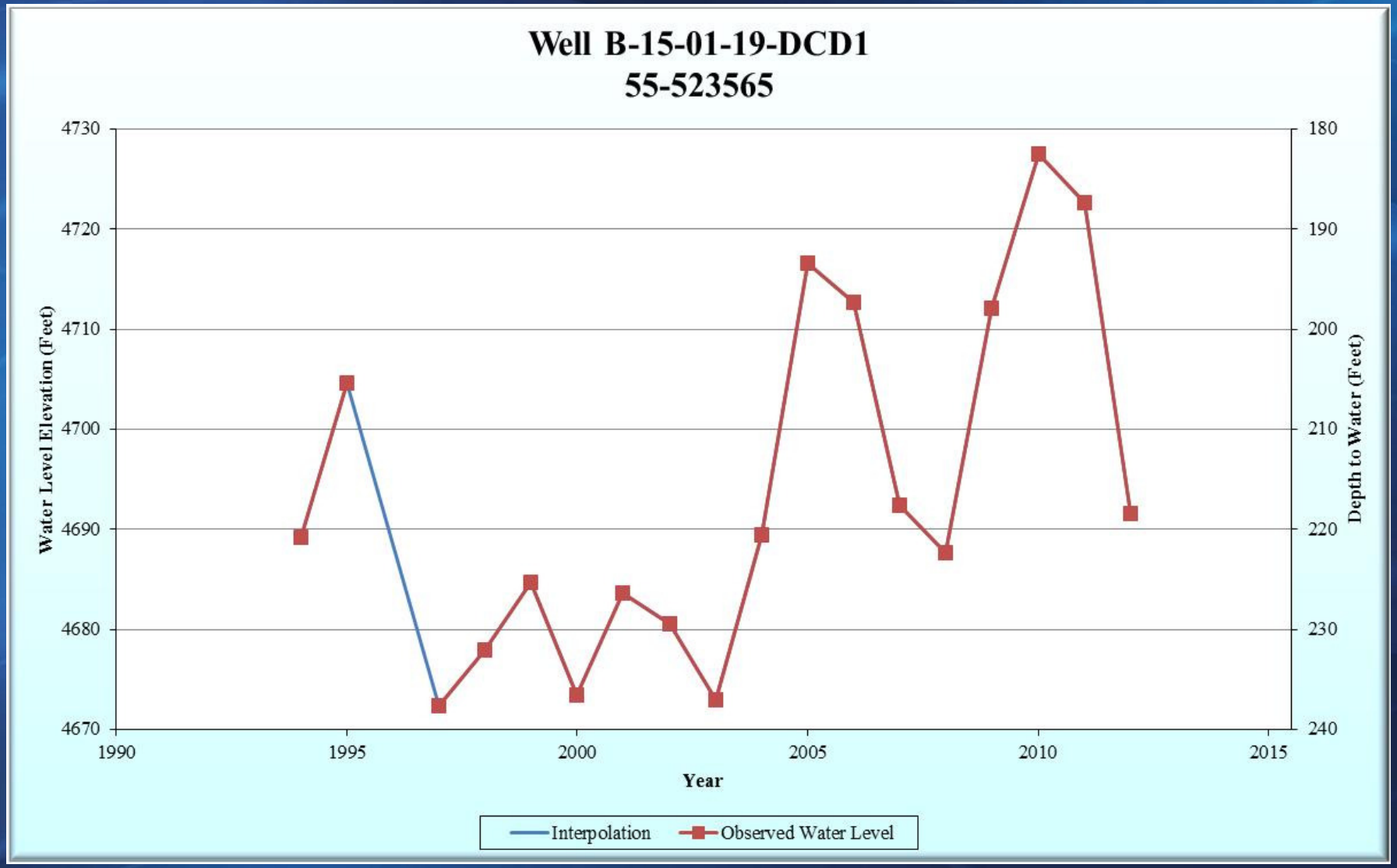


Water Level Change 1994-2010 Prescott AMA

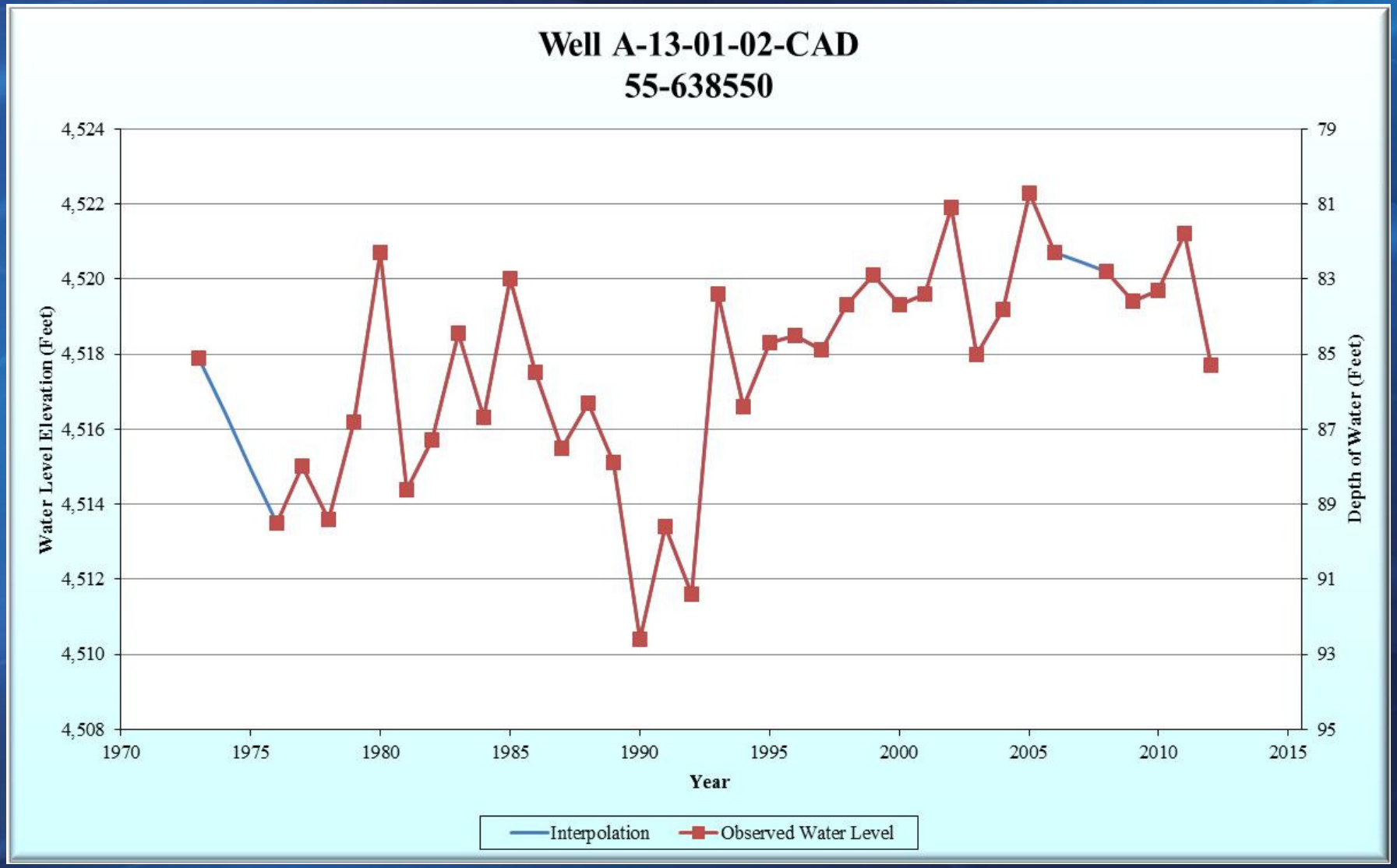
Legend

Water Level Change 1994 - 2010
- Negative
- Positive
- Prescott AMA
- Sub-basin
- City or Town
- Major Road
- Lake
- Stream
- Hardrock
- Township/Range
- County
- State Boundary

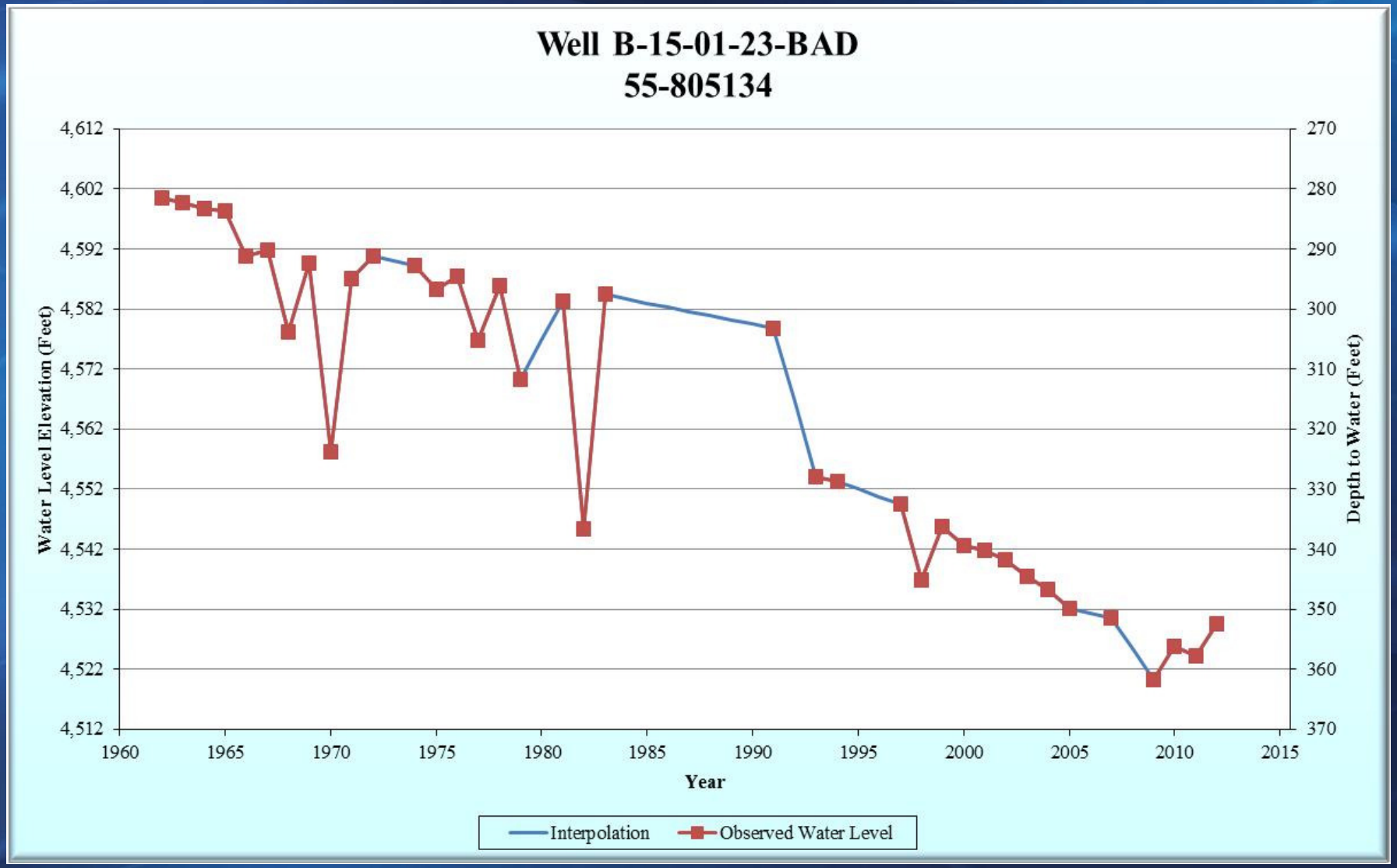
Little Chino Sub-Basin near Prescott Airport along Granite Creek. Shallow well shows response to flood and artificial recharge .



Upper Agua Fria Sub-Basin near Dewey. Peaks correspond to high flow events. Recent gradual increase may correlate to agricultural incidental and artificial recharge.



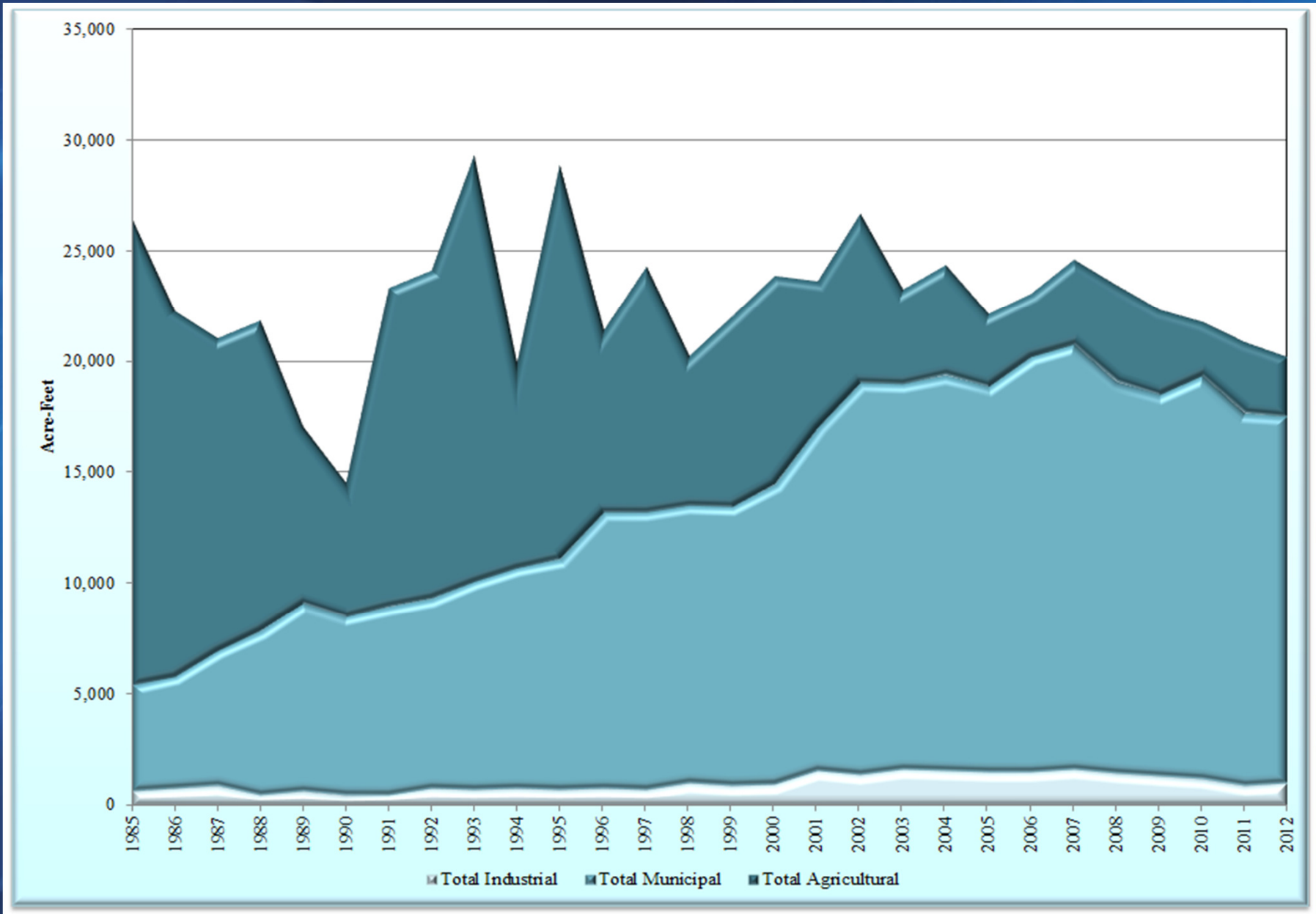
Southern Lonesome Valley area of Little Chino Sub-Basin. Declines caused by regional agricultural and municipal pumping.



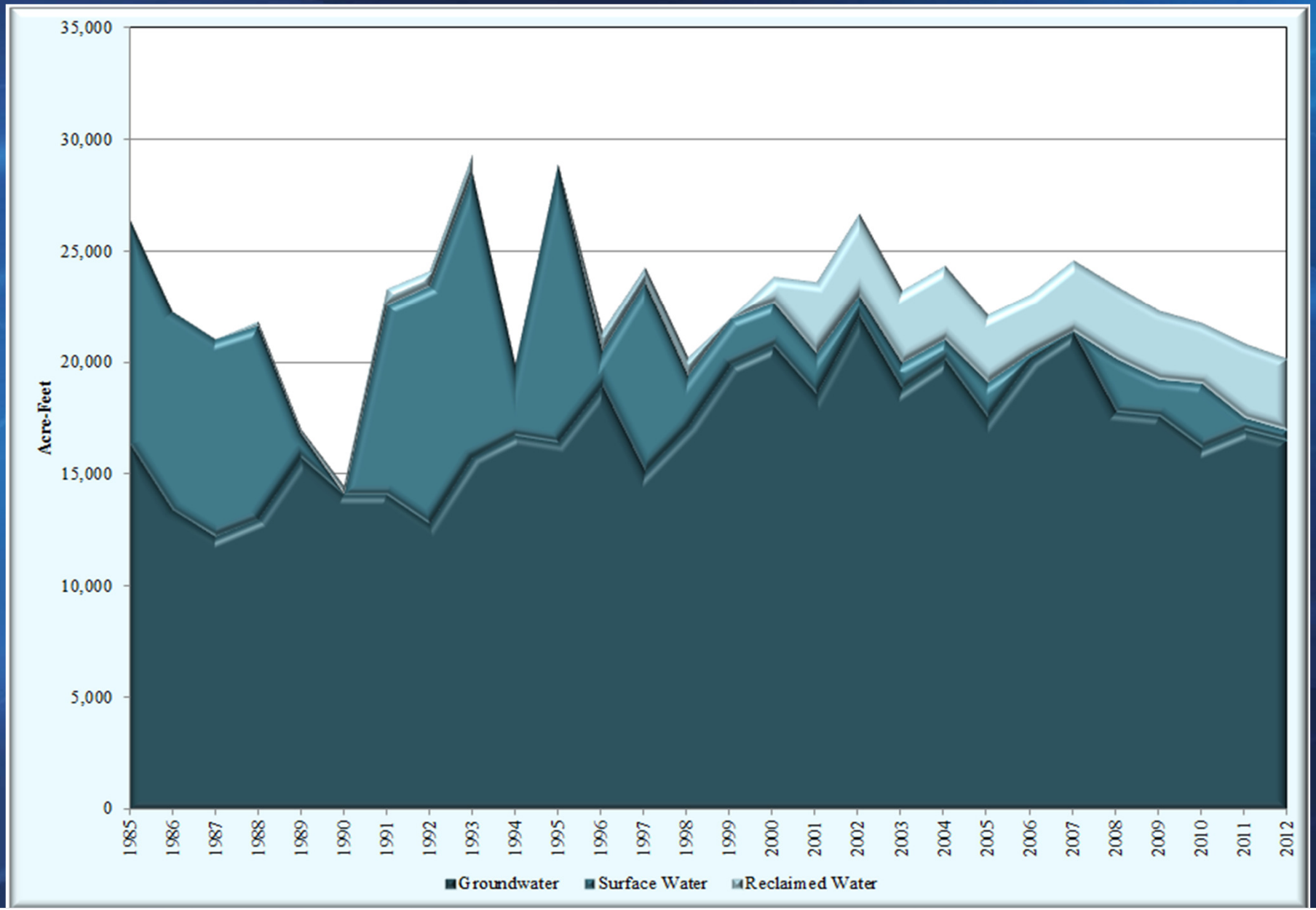
Chapter 3: WATER DEMAND & SUPPLY

- Overall demand in the AMA over historical period (1985-2012) has been around 20,000 – 25,000 acre-feet but shifted from agriculturally to municipally dominated
- 2008-2012 municipal demand has been lower than from 2000-2007
- 2012 municipal demand was 16,521 acre-feet
- Overall AMA groundwater demand steadily increased from 1985-2007, but has been lower (with the lower demand) from 2008-2012
- AMA population estimates between Censuses are generally over or under-estimated; Census "benches" the population
- Looking at the sum of large provider gallons per capita per day (GPCD) in the Census years:
  - 1990 = 143 GPCD
  - 2000 = 149 GPCD
  - 2010 = 130 GPCD

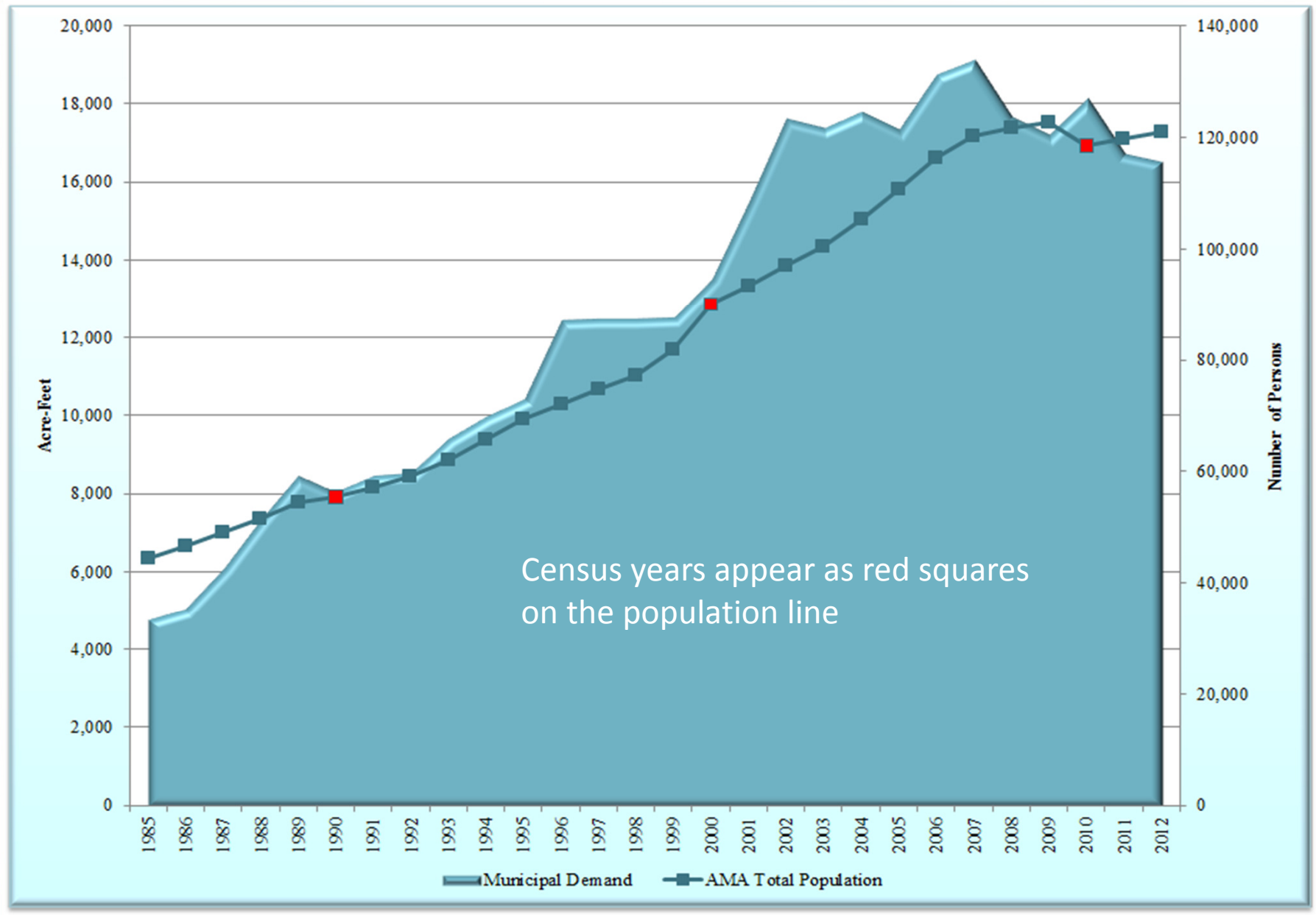
HISTORICAL WATER DEMAND BY SECTOR



HISTORICAL WATER SUPPLIES USED



HISTORICAL MUNICIPAL DEMAND AND TOTAL AMA POPULATION



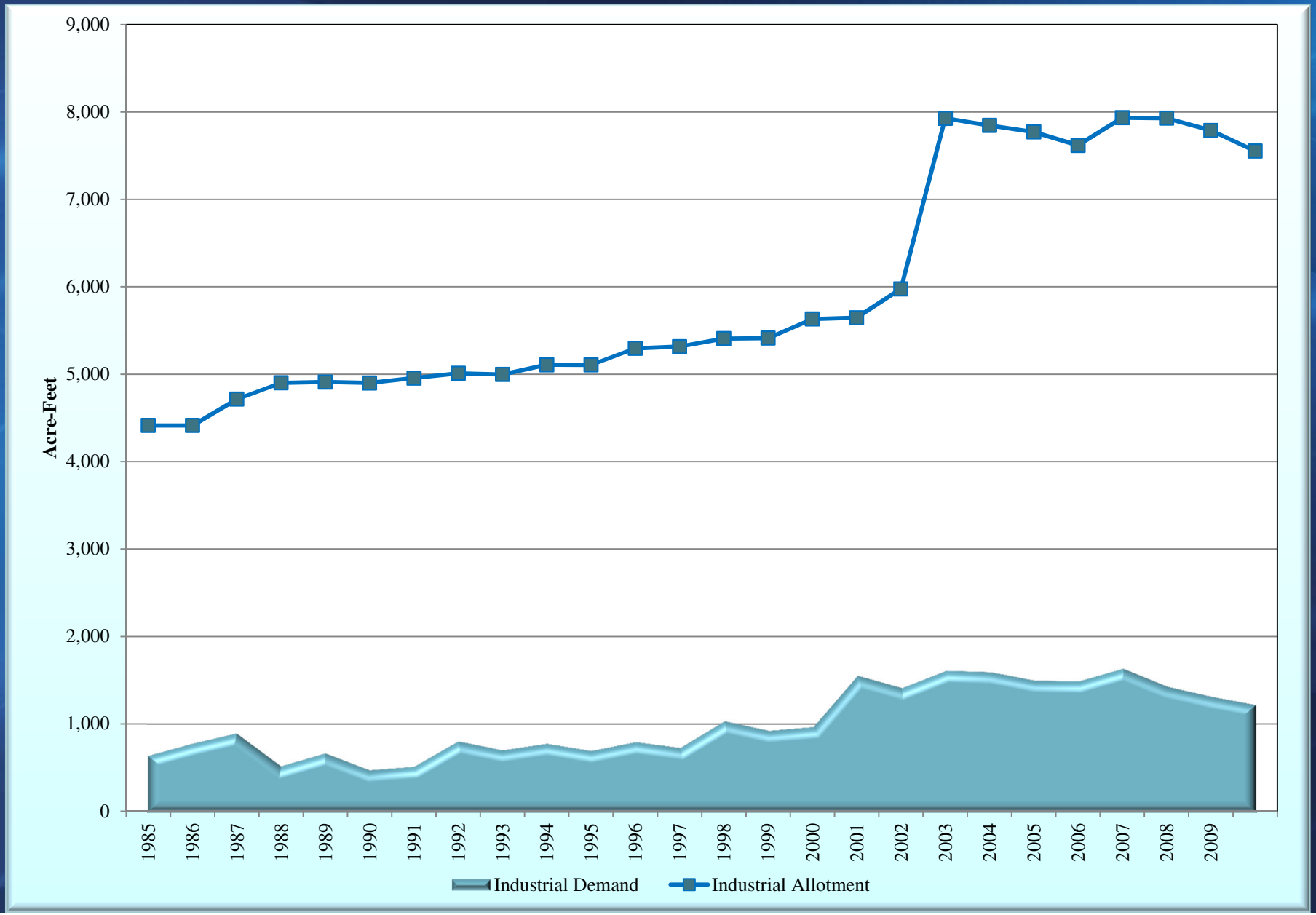
Chapter 3: WATER DEMAND & SUPPLY

- Industrial sector
  - Using less than 20% of Industrial allotment
  - Used about 1,000 acre-feet in 2012
- Agricultural sector
  - About 28 IGFRs >10 acres remaining
  - About 1,100 irrigation acres remaining with about 4,000 acre-feet of allotment
  - In 2012, agricultural demand was about 2,700 acre-feet

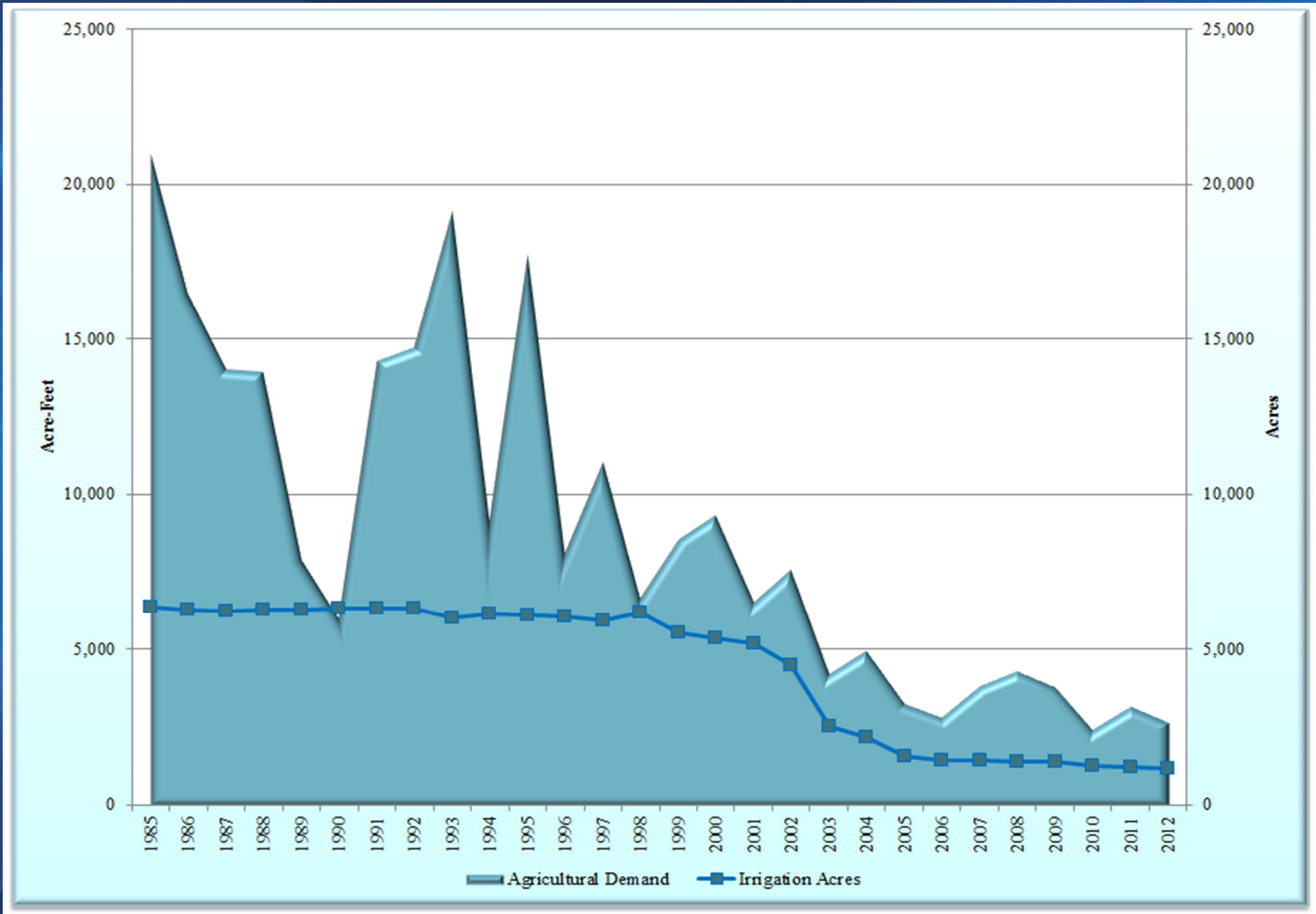
Chapter 3: WATER DEMAND & SUPPLY

- 180 grandfathered groundwater rights (GFRs) in PRAMA have been extinguished pursuant to the AWS Rules:
  - 4,200 acres out of production
  - 176,000 acre-feet of extinguishment credits
  - About 12,000 acre-feet of pledged extinguishment credits
  - Remaining 164,000 acre-feet of extinguishment credits remain unpledged
- If all remaining GFRs had extinguished in 2012, it would have generated about 92,000 additional extinguishment credits

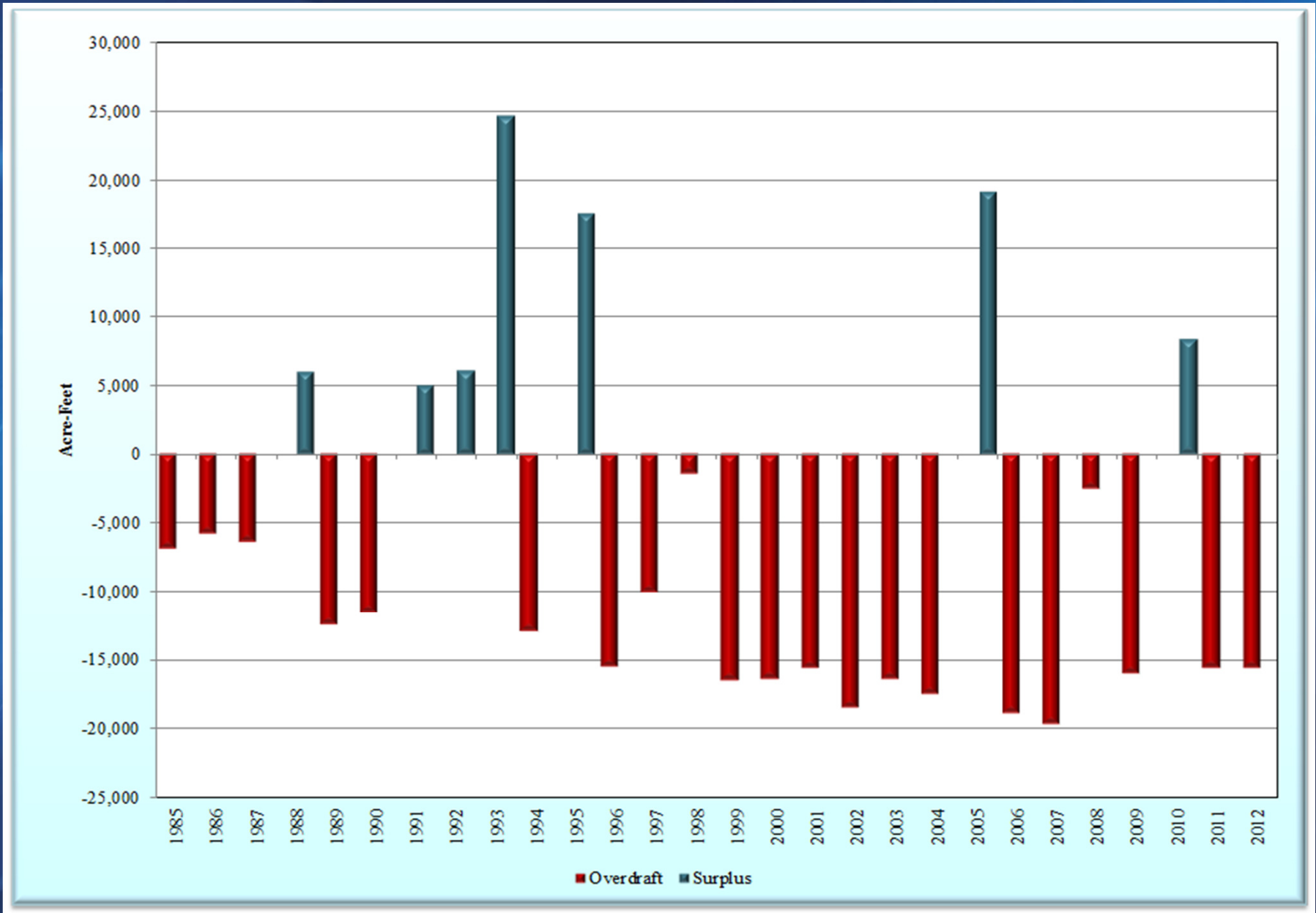
HISTORICAL INDUSTRIAL DEMAND AND ALLOTMENT



HISTORICAL AGRICULTURAL DEMAND AND IRRIGATION ACRES



HISTORICAL OVERDRAFT, 1985-2012



HISTORICAL WATER DEMAND BY SECTOR

Year	Municipal Demand	Industrial Demand	Agricultural Demand	TOTAL AMA DEMAND	Renewable Supplies to Meet Demand[1]	Ground-water to Meet Demand	Offsets to GW Pumping[2]	OVERDRAFT
1985	4,789	641	20,987	26,418	10,005	16,413	9,533	(6,880)
1986	5,060	779	16,469	22,309	8,832	13,476	7,698	(5,779)
1987	6,129	895	14,043	21,067	8,789	12,278	5,929	(6,350)
1988	7,374	523	13,950	21,847	8,769	13,078	19,131	6,053
1989	8,505	669	7,927	17,101	1,310	15,791	3,410	(12,381)
1990	8,068	476	6,040	14,585	427	14,158	2,633	(11,526)
1991	8,486	516	14,321	23,323	9,172	14,151	19,240	5,089
1992	8,560	805	14,729	24,094	11,250	12,844	18,933	6,089
1993	9,444	704	19,172	29,320	13,497	15,822	40,507	24,685
1994	9,974	778	9,207	19,960	3,180	16,780	3,867	(12,913)
1995	10,448	696	17,745	28,889	12,415	16,475	34,003	17,528
1996	12,470	796	8,149	21,415	2,422	18,992	3,540	(15,453)
1997	12,523	731	11,057	24,311	9,116	15,195	5,113	(10,082)
1998	12,520	1,035	6,688	20,243	3,084	17,159	15,730	(1,429)
1999	12,549	926	8,566	22,041	2,167	19,875	3,389	(16,486)
2000	13,532	967	9,367	23,866	3,114	20,752	4,397	(16,355)
2001	15,503	1,550	6,567	23,619	4,996	18,624	3,097	(15,527)
2002	17,635	1,411	7,627	26,674	4,571	22,103	3,652	(18,451)
2003	17,386	1,608	4,254	23,247	4,358	18,889	2,006	(16,883)
2004	17,805	1,591	4,990	24,386	4,227	20,159	2,363	(17,796)
2005	17,360	1,496	3,302	22,158	4,565	17,593	36,696	19,104
2006	18,754	1,486	2,847	23,087	3,011	20,076	1,211	(18,865)
2007	19,144	1,630	3,868	24,642	3,254	21,388	1,733	(19,656)
2008	17,660	1,425	4,359	23,444	5,649	17,795	15,240	(2,555)
2009	17,206	1,312	3,822	22,340	4,686	17,654	1,721	(15,933)
2010	18,152	1,218	2,455	21,825	5,583	16,242	24,606	8,364
2011	16,750	925	3,231	20,906	3,876	17,030	1,455	(15,575)
2012	16,521	1,011	2,683	20,215	3,649	16,566	1,020	(15,546)

Chapter 4: AGRICULTURAL

- Program unchanged from Third Management Plan (3MP)
- Agricultural sector contribution to Safe-Yield
  - prohibition on new acres coming into production,
  - improved on-farm irrigation practices,
  - decreasing reliance on groundwater (recovered reclaimed water by the Chino Valley Irrigation District),
  - reduction in irrigation acres due to retirement or development
- No farms in the Best Management Practices (BMP) program in PRAMA

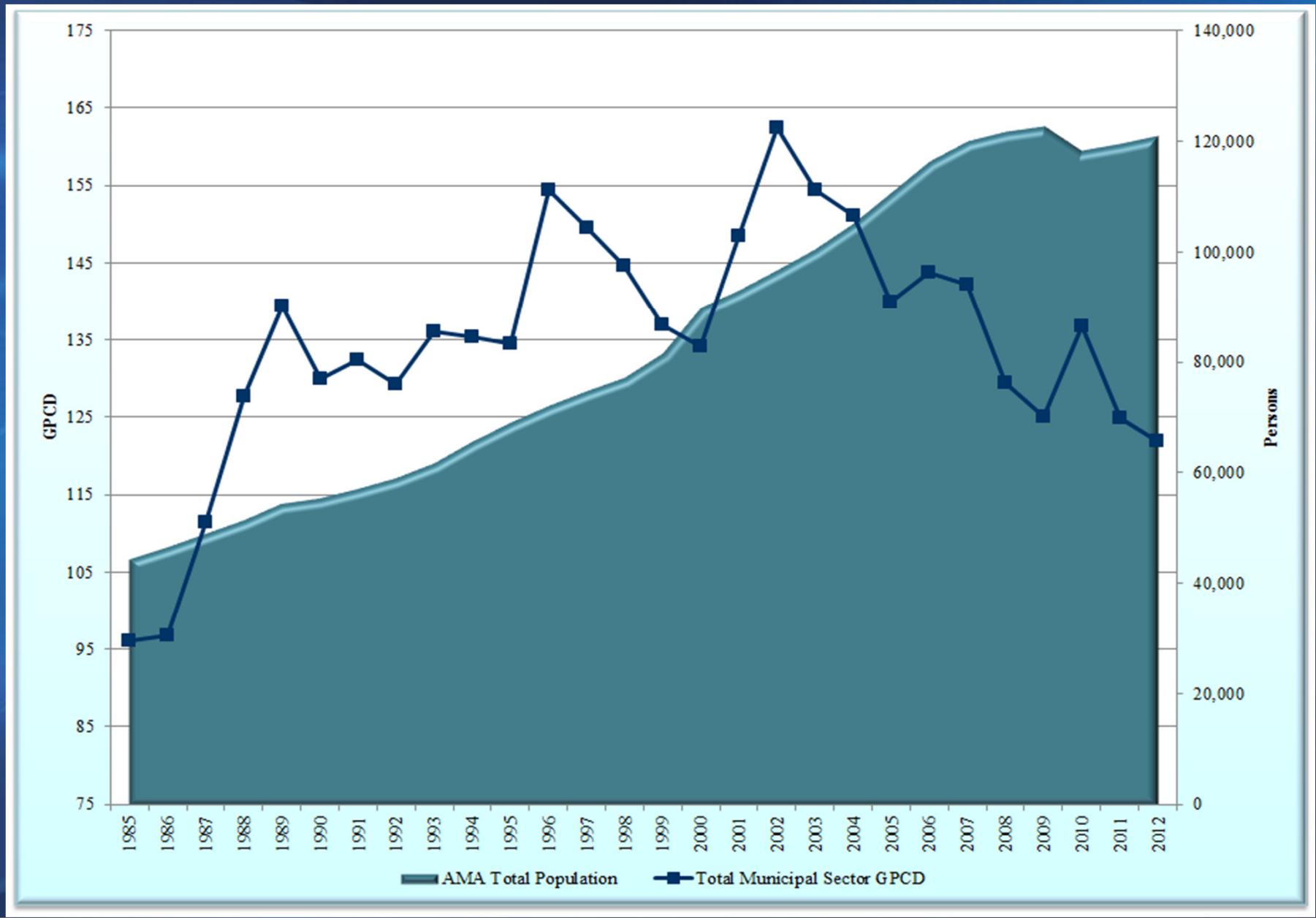
HISTORICAL AGRICULTURAL SECTOR DEMAND AND SUPPLY

Year	Demand	Groundwater	Surface Water	Reclaimed Water	Allotment
1985	20,987	11,192	9,795	0	28,078
1986	16,469	7,913	8,556	0	28,091
1987	14,043	5,513	8,530	0	27,956
1988	13,950	5,490	8,460	0	28,045
1989	7,927	6,794	1,134	0	28,031
1990	6,040	5,958	83	0	28,202
1991	14,321	5,861	8,460	0	28,597
1992	14,729	4,129	10,600	0	28,748
1993	19,172	6,452	12,720	0	26,972
1994	9,207	6,027	3,180	0	27,498
1995	17,745	5,331	12,415	0	27,263
1996	8,149	6,569	1,580	0	27,215
1997	11,057	2,597	8,460	0	26,581
1998	6,688	4,342	2,303	43	27,767
1999	8,566	6,447	2,120	0	24,869
2000	9,367	7,090	1,155	1,122	17,680
2001	6,567	4,167	900	1,499	17,450
2002	7,627	5,227	900	1,500	15,408
2003	4,254	2,754	0	1,500	8,083
2004	4,990	3,490	0	1,500	6,956
2005	3,302	2,091	0	1,211	5,224
2006	2,847	2,065	0	782	4,753
2007	3,868	2,801	0	1,068	4,744
2008	4,359	3,256	0	1,103	4,535
2009	3,822	2,717	0	1,105	4,535
2010	2,455	1,618	0	837	4,088
2011	3,231	2,260	0	971	4,067
2012	2,683	1,689	0	994	3,966

Chapter 5: MUNICIPAL

- Historical objective of municipal program to gradually reduce GPCD, encourage conservation, maximize efficient use of all water supplies
- For 4MP ADWR increasing efforts to solve water management issues and obstacles and improve progress towards Safe-Yield. For the fourth management period ADWR will:
  - Encourage equitable distribution of water through long-range planning,
  - Encourage cooperative regional efforts,
  - Provide technical assistance,
  - Provide public education materials,
  - Implement regulatory programs.
- In the PRAMA annual population growth averaged about 3.8% from 1985-2012
- As AMA population has increased, AMA overall average GPCD has decreased (assumed GPCD for exempt well population)

HISTORICAL MUNICIPAL GPCD AND POPULATION



Chapter 5: MUNICIPAL

- Additional efforts are needed to achieve and maintain SY:
  - Increased conservation efforts
  - Geographic redistribution of AMA water supplies, in part through recharge and recovery within the area of impact
  - Water importation
  - Changing pumping regimes and adding augmentation efforts
- Only Total GPCD and the Non Per Capita Conservation Program (NPCCP) for the 4MP for large providers
  - Providers with DAWS in the NPCCP will initially be noticed under the Total GPCD for the 4MP and will be able to opt back into the NPCCP after initial noticing
  - Total GPCD Program one target for the whole fourth management period (both large providers are currently in the NPCCP)
    - City of Prescott draft 4MP GPCD target = 172 GPCD

HISTORICAL MUNICIPAL DEMAND AND COMMITTED DEMAND

Year	Demand	Groundwater Demand	Surface Water	Reclaimed Water	*Cumulative Committed Demand*
1985	4,789	4,579	210	-	*637*
1986	5,060	4,784	276	-	*665*
1987	6,129	5,870	259	-	*774*
1988	7,374	7,066	121	187	*834*
1989	8,505	8,329	-	176	*986*
1990	8,068	7,724	-	344	*1,104*
1991	8,486	7,774	-	712	*1,146*
1992	8,560	7,910	-	650	*1,204*
1993	9,444	8,666	-	777	*1,256*
1994	9,974	9,974	-	-	*1,359*
1995	10,448	10,448	-	-	*2,097*
1996	12,470	11,627	-	842	*2,283*
1997	12,523	11,867	-	656	*2,485*
1998	12,520	11,781	-	738	*2,698*
1999	12,549	12,503	-	47	*3,943*
2000	13,532	12,694	825	12	*7,200*
2001	15,503	13,148	688	1,667	*7,200*
2002	17,635	15,464	-	2,171	*7,206*
2003	17,386	14,593	1,064	1,729	*7,234*
2004	17,805	15,128	864	1,813	*7,306*
2005	17,360	14,059	1,548	1,752	*7,408*
2006	18,754	16,651	229	1,875	*7,493*
2007	19,144	17,025	-	2,119	*7,568*
2008	17,660	13,176	2,331	2,152	*7,579*
2009	17,206	13,674	1,569	1,963	*7,579*
2010	18,152	13,470	2,784	1,898	*7,579*
2011	16,750	13,875	548	2,327	*7,579*
2012	16,521	13,913	445	2,163	*7,579*

Chapter 6: INDUSTRIAL

- Program unchanged from 3MP
- Historical objectives of industrial program:
  - Move to highest level of water use efficiency economically attainable using the latest conservation technology,
  - Efficient use of groundwater and,
  - Increased use of renewable supplies
- Major Industrial use is golf; four of the six courses in PRAMA use reclaimed water

HISTORICAL INDUSTRIAL DEMAND AND ALLOTMENT

Year	Demand	Groundwater Demand	Surface Water	Reclaimed Water	Allotment
1985	641	641	0	0	4,414
1986	779	779	0	0	4,414
1987	895	895	0	0	4,715
1988	523	523	0	0	4,901
1989	669	669	0	0	4,910
1990	476	476	0	0	4,900
1991	516	516	0	0	4,956
1992	805	805	0	0	5,010
1993	704	704	0	0	4,997
1994	778	778	0	0	5,108
1995	696	696	0	0	5,106
1996	796	796	0	0	5,296
1997	731	731	0	0	5,316
1998	1,035	1,035	0	0	5,408
1999	926	926	0	0	5,413
2000	967	967	0	0	5,631
2001	1,550	1,309	241	0	5,646
2002	1,411	1,411	0	0	5,976
2003	1,608	1,542	66	0	7,927
2004	1,591	1,541	50	0	7,845
2005	1,496	1,442	54	0	7,771
2006	1,486	1,360	126	0	7,618
2007	1,630	1,562	68	0	7,934
2008	1,425	1,362	63	0	7,928
2009	1,312	1,263	49	0	7,788
2010	1,218	1,153	65	0	7,553
2011	925	895	30	0	6,137
2012	1,011	964	47	0	5,937

Chapter 7: WATER QUALITY

- No Water Quality Assurance Revolving Fund (WQARF) or Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) sites in PRAMA until 2008 when the Iron King Mine-Humboldt Smelter was added to the National Priorities List
- Water quality not historically a problem in PRAMA
- During the fourth management period, ADWR will continue to monitor water levels, subsidence, and other changes at remedial project sites

Chapter 8: AUGMENTATION & RECHARGE

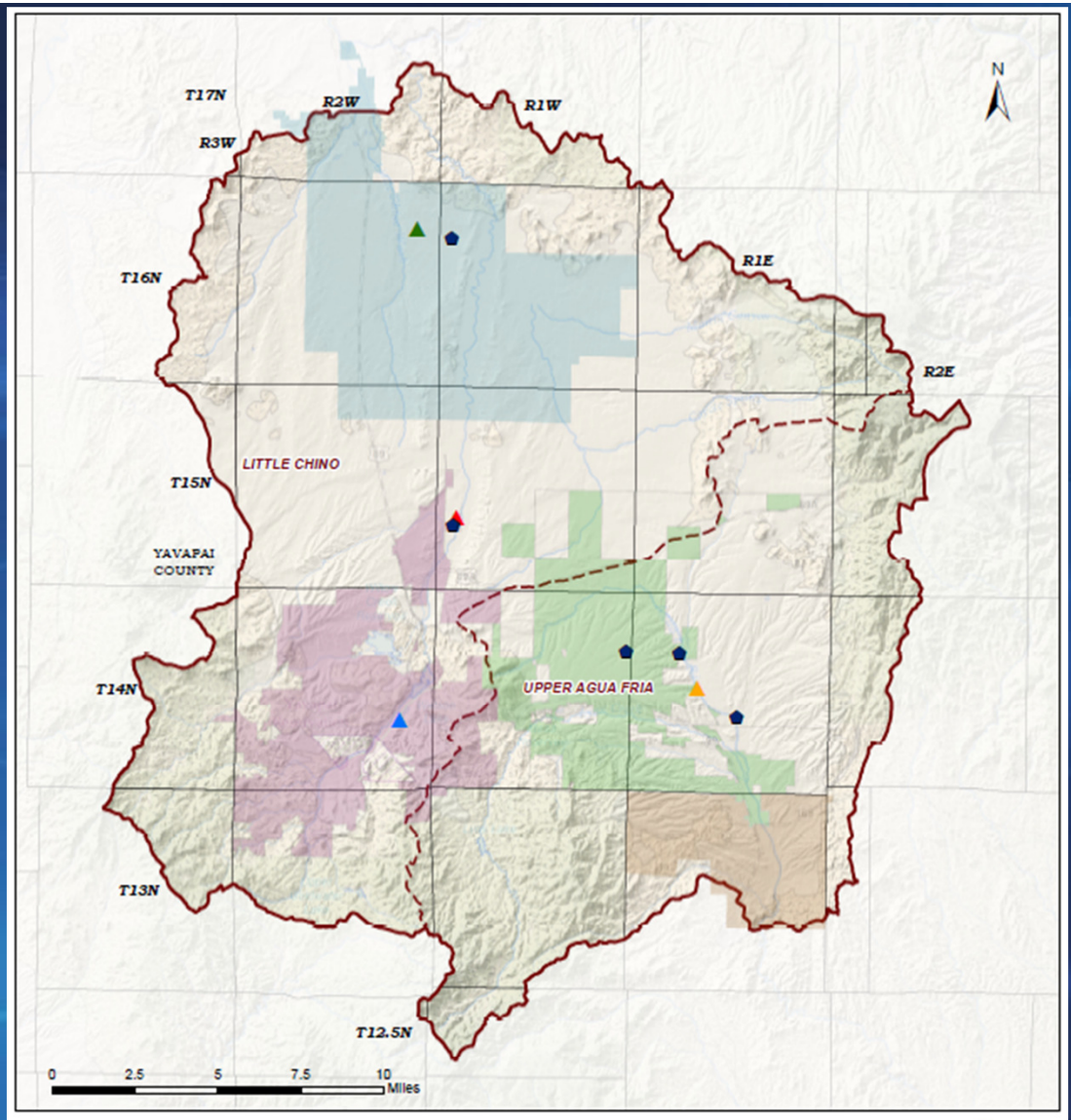
- Objective of the program is to encourage the development, delivery, use, and storage of renewable water supplies to support achievement of Safe-Yield
- Increasing use of renewable supplies to replace groundwater is the primary component of achieving Safe-Yield in PRAMA
- Program objectives for the fourth management period reflect increased awareness and improved understanding of the importance of water management at the local level
- Total water stored through 2012 = 74,000 acre-feet
- Total water recovered through 2012 = 31,000 acre-feet
- Storage and recovery is concentrated in the Little Chino subbasin (Prescott and Chino Valley)
- Little of the water recovered has been recovered within the area of impact

SUMMARY OF WATER STORAGE AND RECOVERY, 1986 - 2012

	Subbasin	Little Chino	Upper Agua Fria	AMA TOTAL
Delivered to be Stored through 2012	USF Reclaimed	43,382	17,380	60,762
	USF Surface Water	13,329	0	13,329
	TOTAL STORED THROUGH 2012	*56,711*	*17,380*	*74,091*
Recovered through 2012	Reclaimed	17,872	25	17,897
	Surface Water	12,978	0	12,978
	TOTAL RECOVERED THROUGH 2012	*27,106*	*25*	*30,875*
Recovered Water in 2012	Reclaimed	1,414	0	1,414
	Surface Water	445	0	445
	Total	1,859	0	859
	Within 1 mile of any storage location	*421*	*0*	*421*
Recovered Water in 2005	Reclaimed	1,234	6	1,240
	Surface Water	1,547	0	1,547
	Total	2,781	6	2,787
	Within 1 mile of any storage location	*0*	*0*	*0*

Chapter 8: AUGMENTATION & RECHARGE

- Four active USFs in PRAMA as of 2012
- Total Long-Term Storage (LTS) credits as of 2011 = 34,306 acre-feet (all reclaimed water)
- Fourth management period augmentation/recharge goals:
  - Maximize storage
  - Develop regional recharge and recovery plan recognizing the importance of recovering within the area of impact of storage
  - Expand groundwater and surface water monitoring
  - Explore the benefit of interregional water exchanges
  - Research and identify augmentation measures for future implementation
  - Assess potential to develop alternative supplies outside the AMA



PRAMA
Figure 8-1
Wastewater Treatment Plant Locations

Legend

Prescott AMA
Sub-basin
City or Town
Major Road
Lake
Stream
Hardrock
Prescott National Forest
State Boundary
Township/Range
County

NAME
City of Prescott - Sundog WWTP
City of Prescott - Wastewater Infiltration Basin
Town of Chino Valley - Wastewater Reclamation Facility
Town of Prescott Valley - WWTP
Underground Storage Facility (Recharge) Site

Chapter 9: WATER MANAGEMENT ASSISTANCE

- Purpose of Water Management Assistance Program (WMAP) is to provide financial and technical resources to help water users develop and implement conservation programs, facilitate augmentation and renewable supply utilization, and collect hydrologic information
- Total monies collected since 1997 = $252,121
- Total collected in 2012 = $14,732
- Six projects funded during the third management period that received in total $110,478
- ADWR estimates about $125,000 likely to be generated for WMAP during the fourth management period (based on projections in 4MP chapter 11)

Chapter 10: IMPLEMENTATION

- No changes were made to chapter 10, except that the preface to the regulatory section of the 3MP was moved to be an appendix to chapter 10. It is in this preface from the 3MP that the “stacking” procedure for compliance is described, so it is important to keep that language for the 4MP.

Chapter 11: BUDGETS

- 3 Scenarios included in Chapter 11
  - Scenario A = “Base Scenario”
  - Scenario B = Additional conservation and importation
  - Scenario C = More conservation and importation, and additional surface water supplies
- ADWR plans to pursue many multiples of scenarios during the fourth management period to analyze areas to focus water management efforts

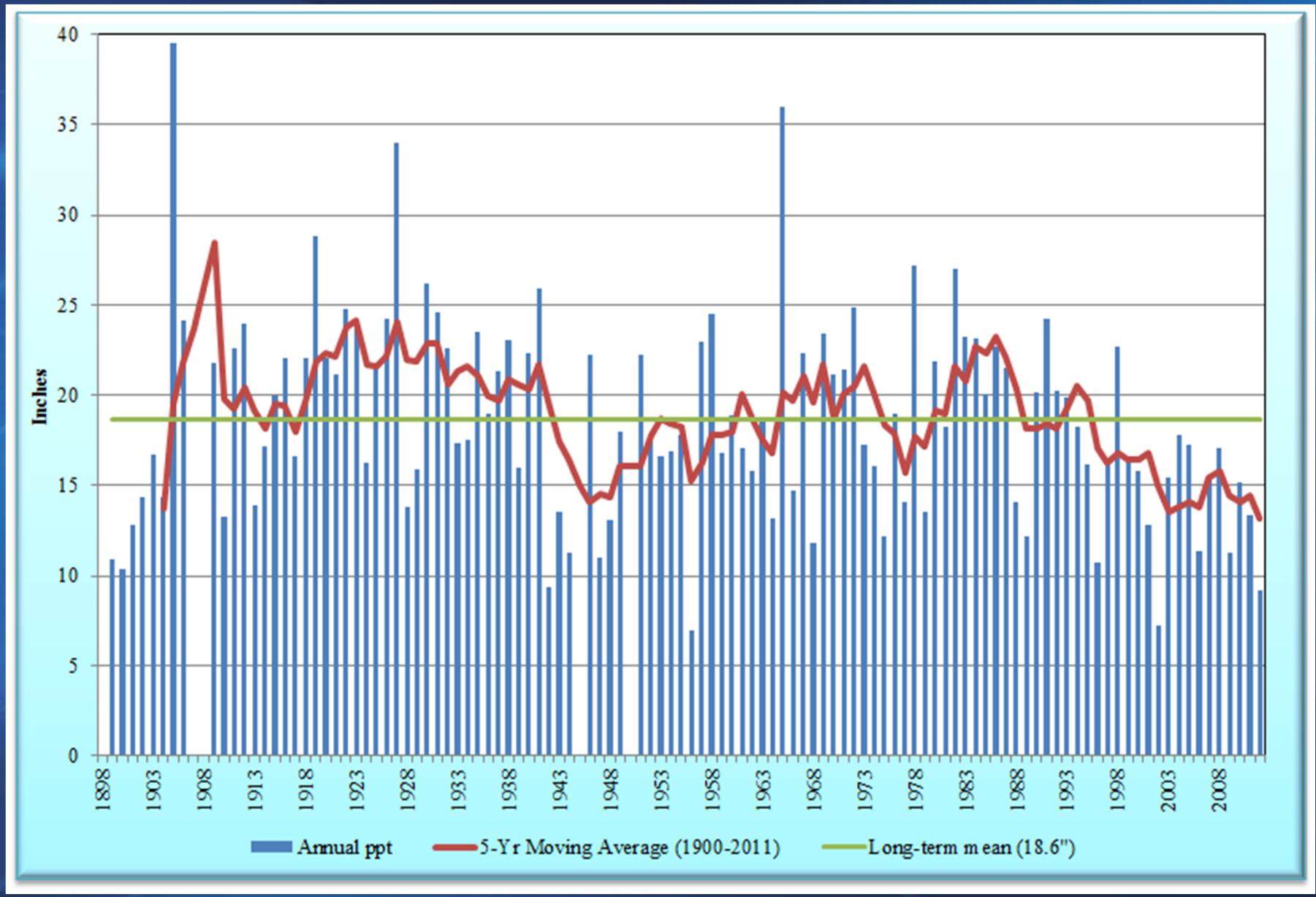
Chapter 11: BUDGETS

- All include BC (ramp-up starting in 2020 and maintaining thereafter)
- All include maximized reclaimed water storage (Granite Creek) via a regional facility (which will require additional infrastructure, recovery within the area of impact of storage, and cooperation among water users)
- All include Assessment Scenario One assumptions for Industrial and Agricultural water demand
- Historical period = 1985-2012, and projection period 2013 – 2025 extended to 2110 to see possible impacts of water management decisions and growth beyond 2025
- Population projections re-calculated with 2010 Census and recent years in the trendline analysis (new projections from the state not out until Fall 2013)
- All include annually fluctuating net natural recharge

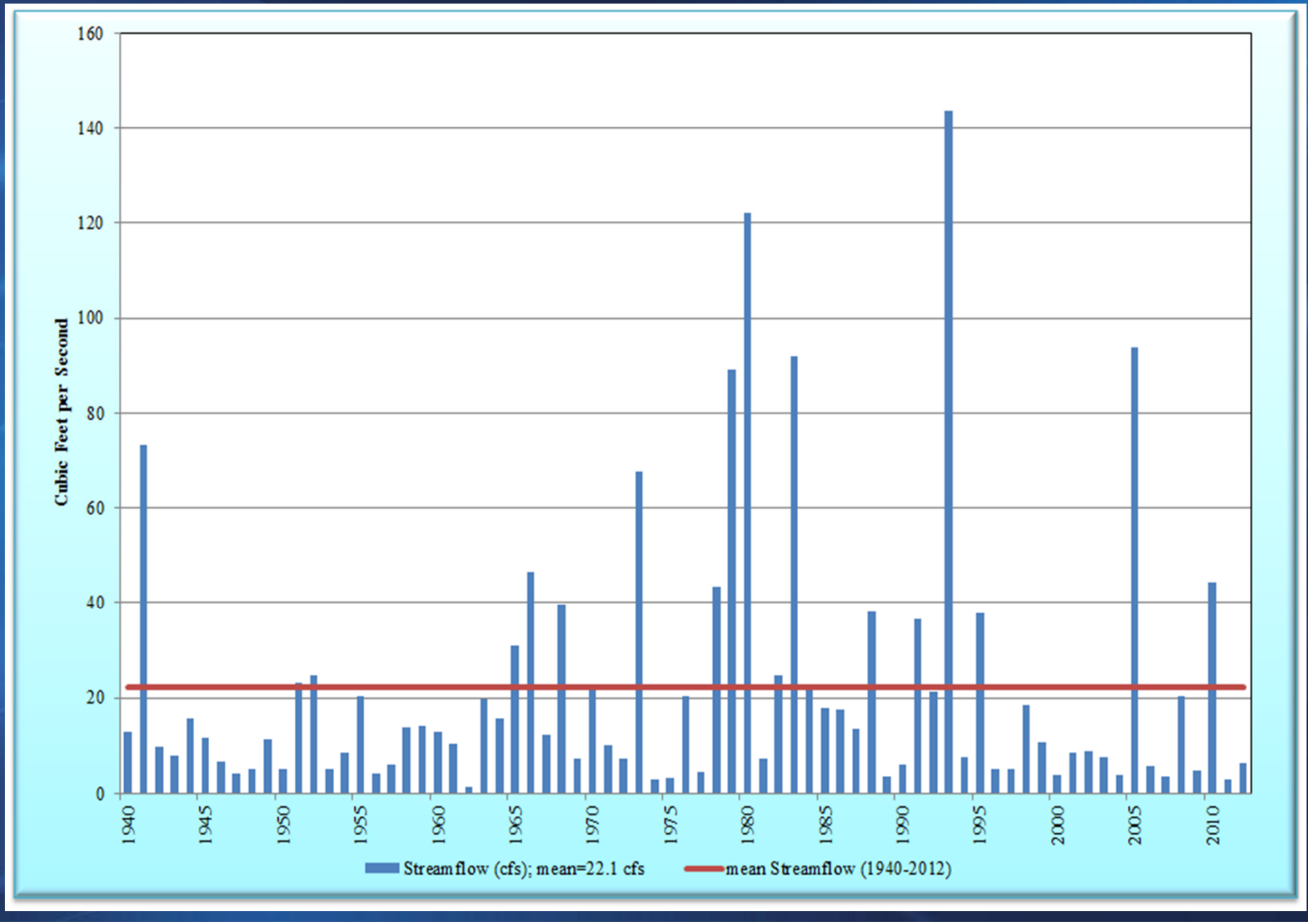
Chapter 11: BUDGETS

- Historical net natural recharge pattern = several years of low precipitation, then a high precipitation (flood flow) year
- Use of long-term average masks water management implications of natural supply variability

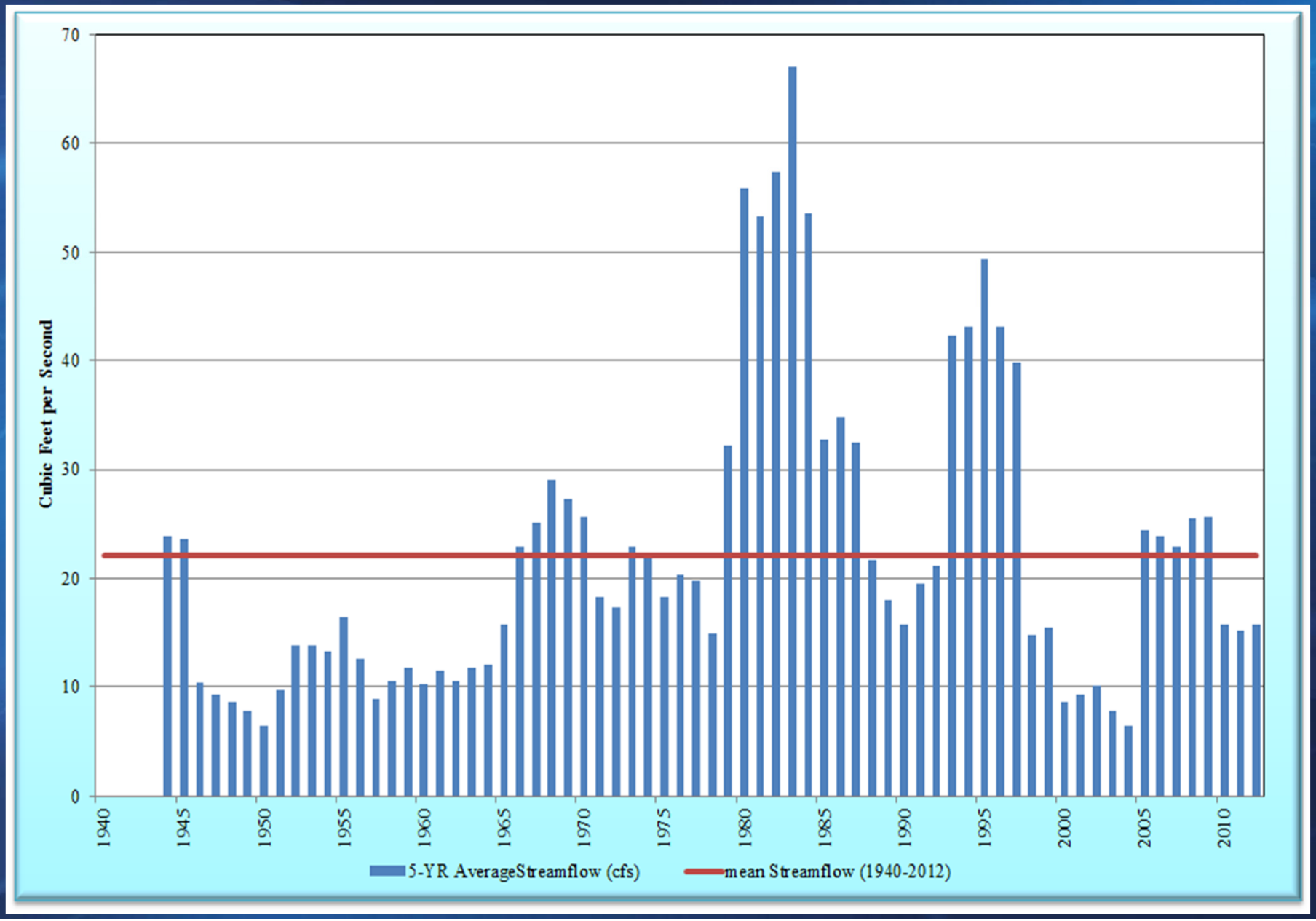
ANNUAL PRECIPITATION



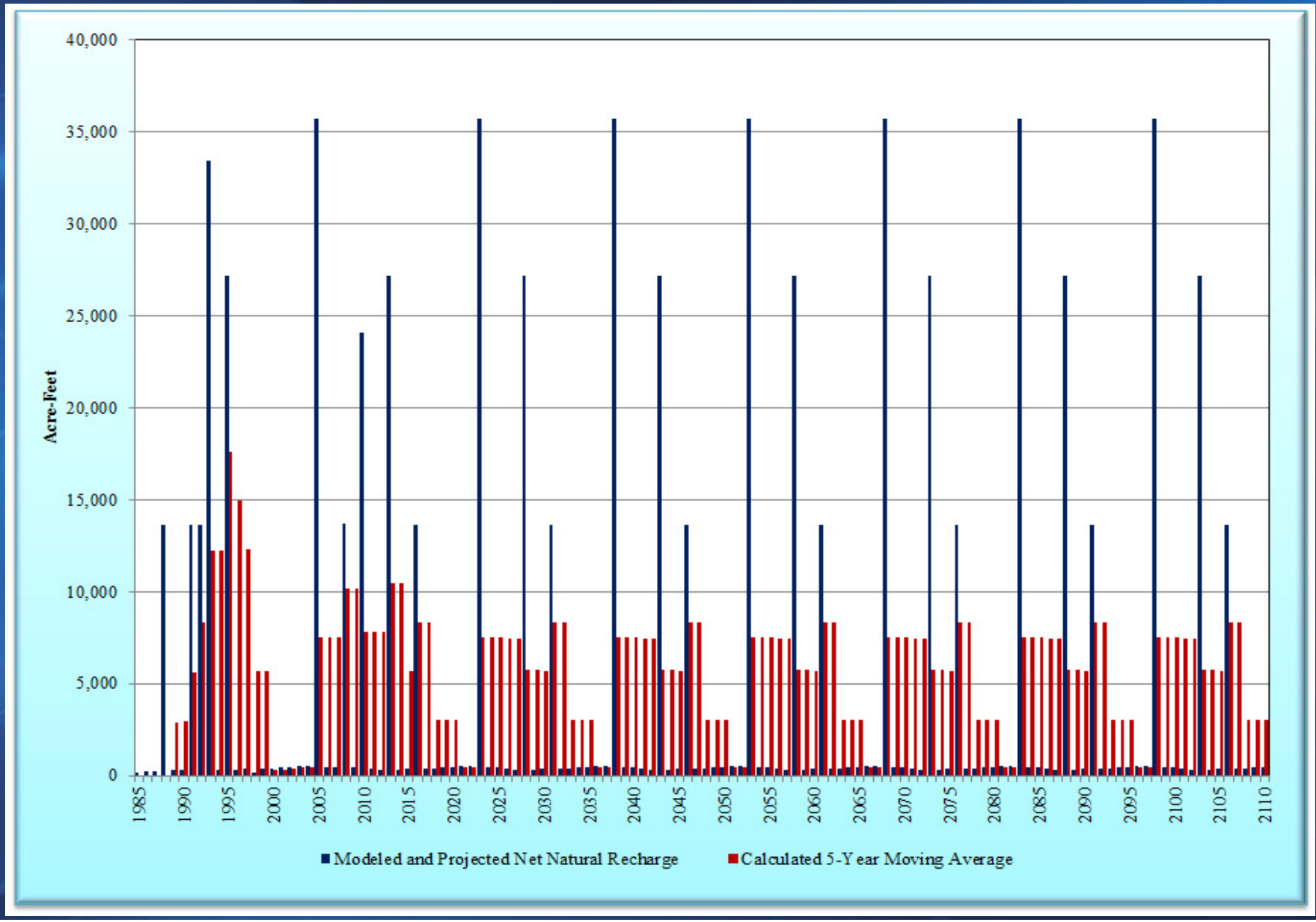
AVERAGE ANNUALIZED STREAMFLOW – AGUA FRIA RIVER NEAR MAYER, ARZIONA



FIVE-YEAR MOVING AVERAGE ANNUALIZED STREAMFLOW AGUA FRIA RIVER NEAR MAYER, ARZIONA



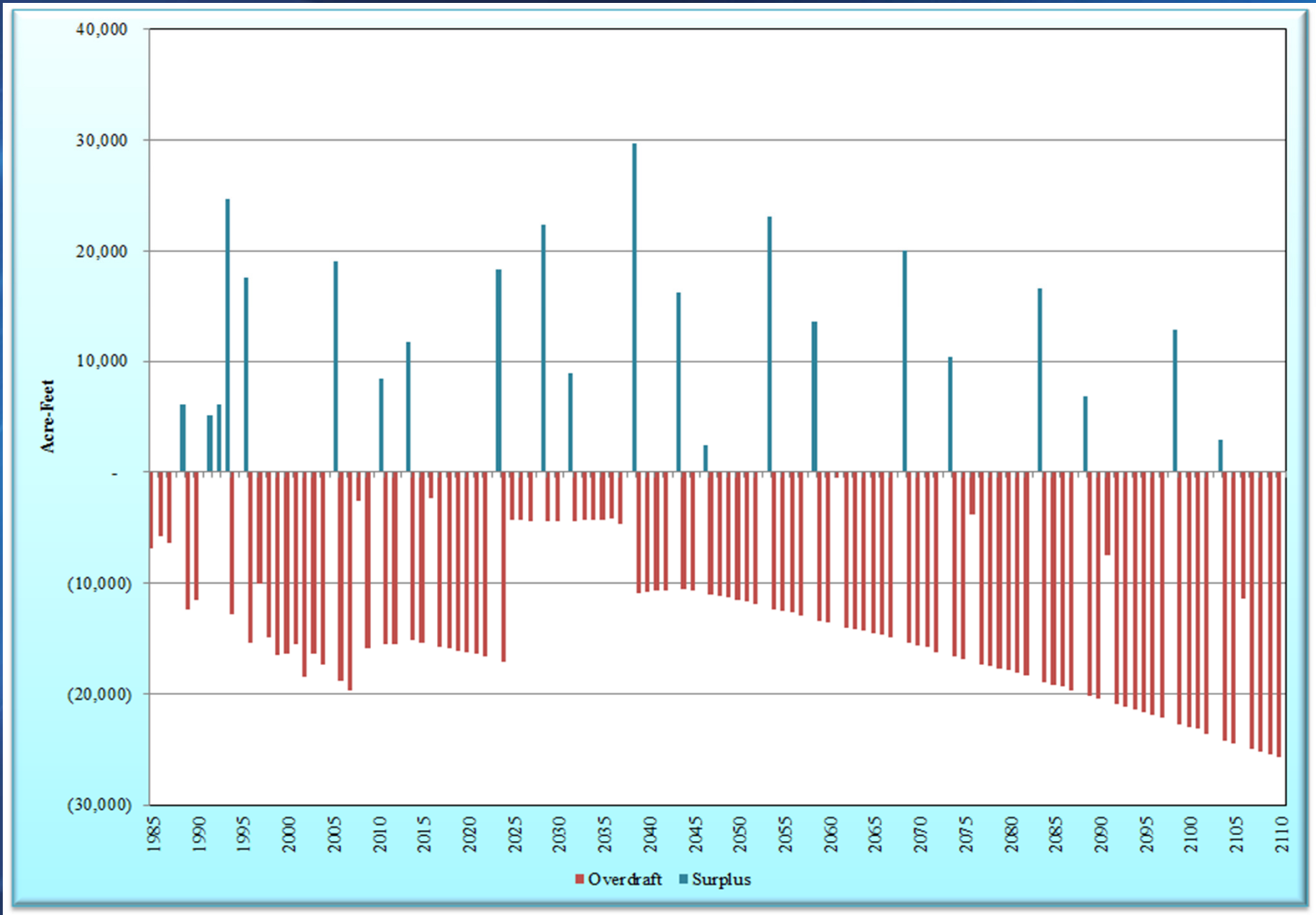
MODELED AND PROJECTED
ANNUAL AND FIVE-YEAR MOVING AVERAGE NET NATURAL RECHARGE



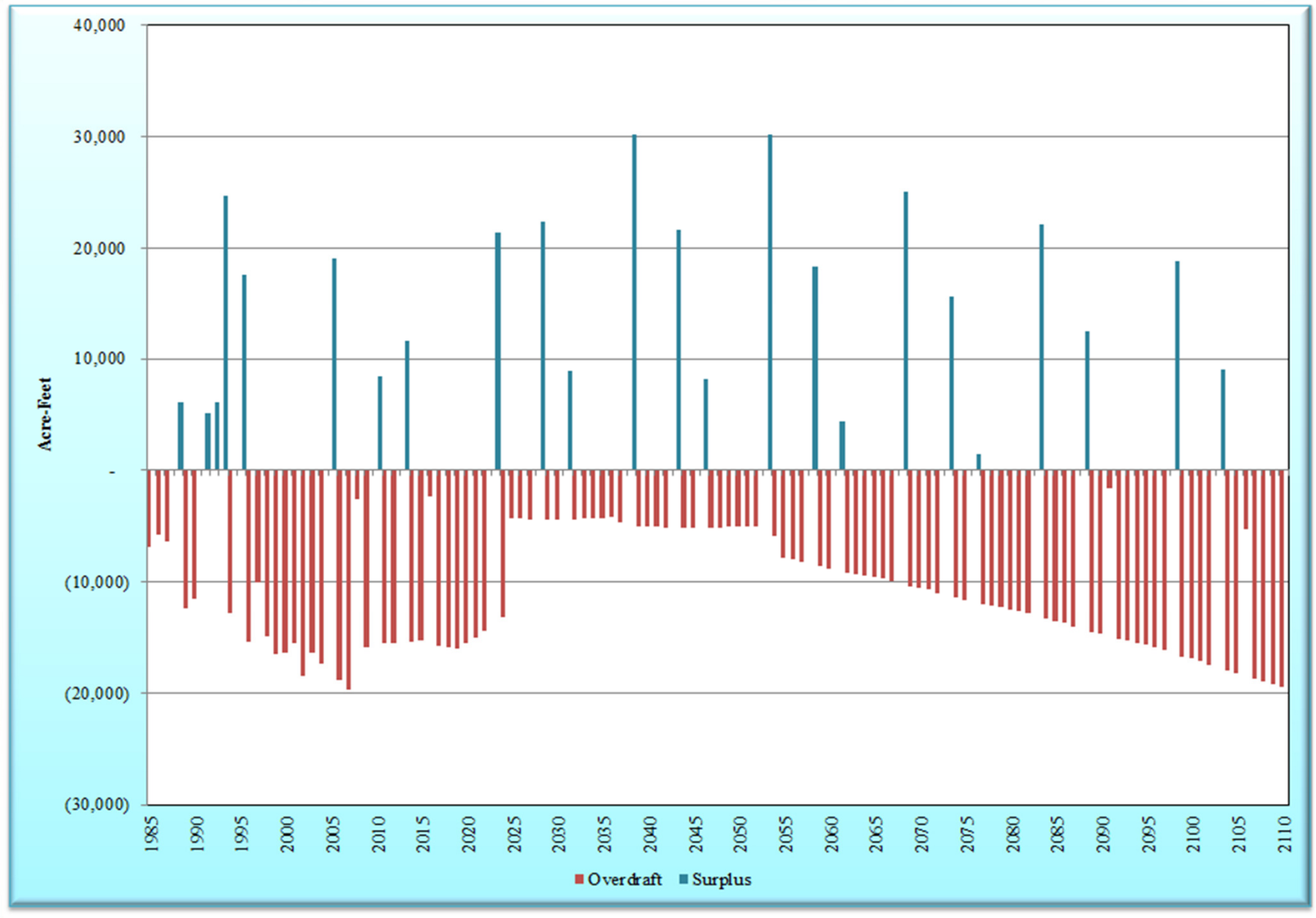
Chapter 11: BUDGETS

- In 2025, rather than pumping more groundwater, municipal groundwater is capped at 3,000 acre-feet/year
- Remainder of municipal demand is direct use reclaimed water, recovered surface water, Big Chino, and recovered reclaimed water;
  - First assumes annual recovery within the area of impact (AOI) of storage for reclaimed
  - If additional reclaimed is needed to meet the remainder of demand it is LTS reclaimed credits;
  - Growth in small providers and exempt wells is either offset with extinguished reclaimed credits (non-recoverable) or directly served (small providers) with reclaimed credits recovered (as much within the AOI as possible)
- These assumptions can get the PRAMA to Safe-Yield in 2025 and depending on the scenario can maintain until 2040, 2055, or 2070

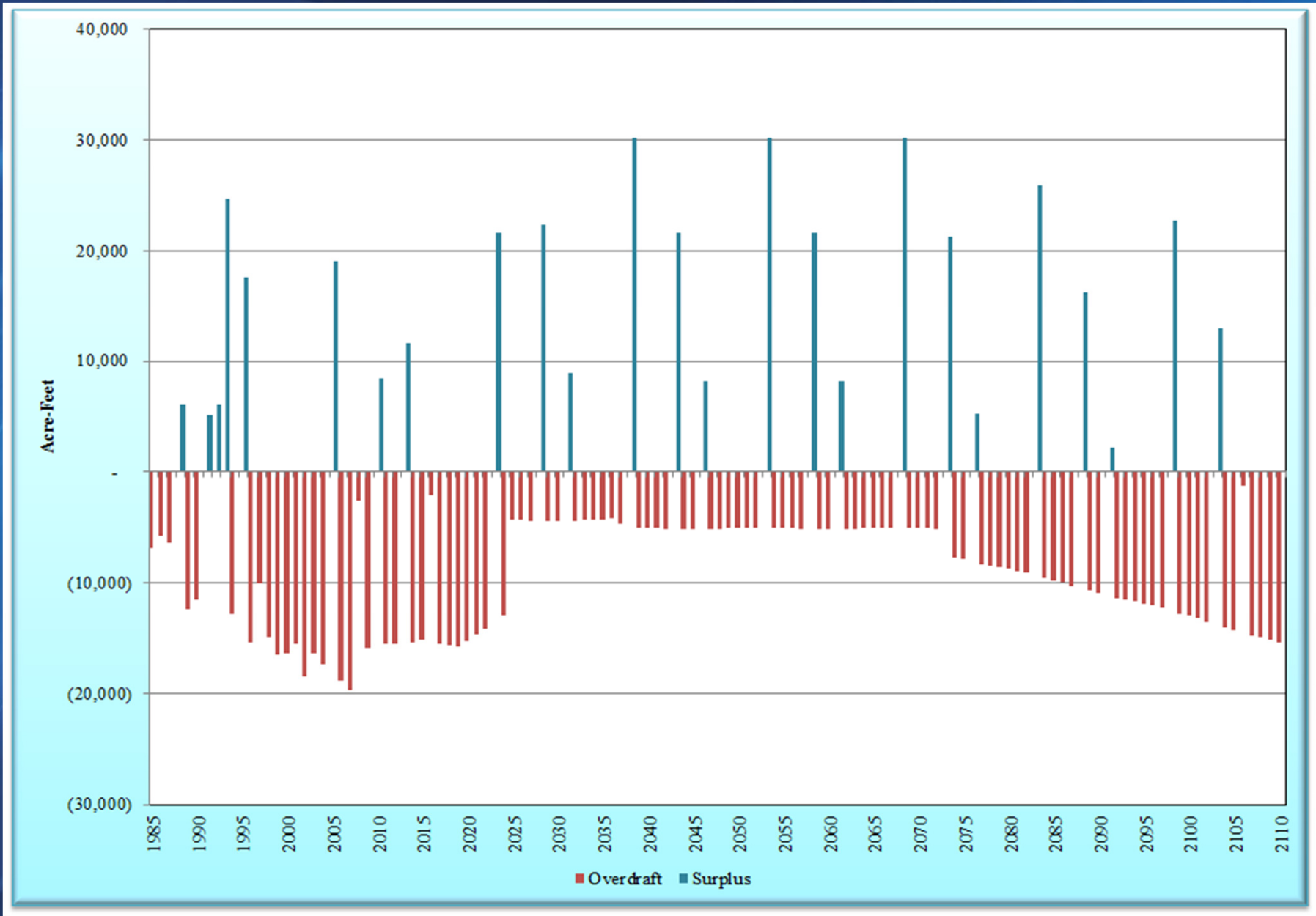
Results Scenario A – ("Base Scenario"):



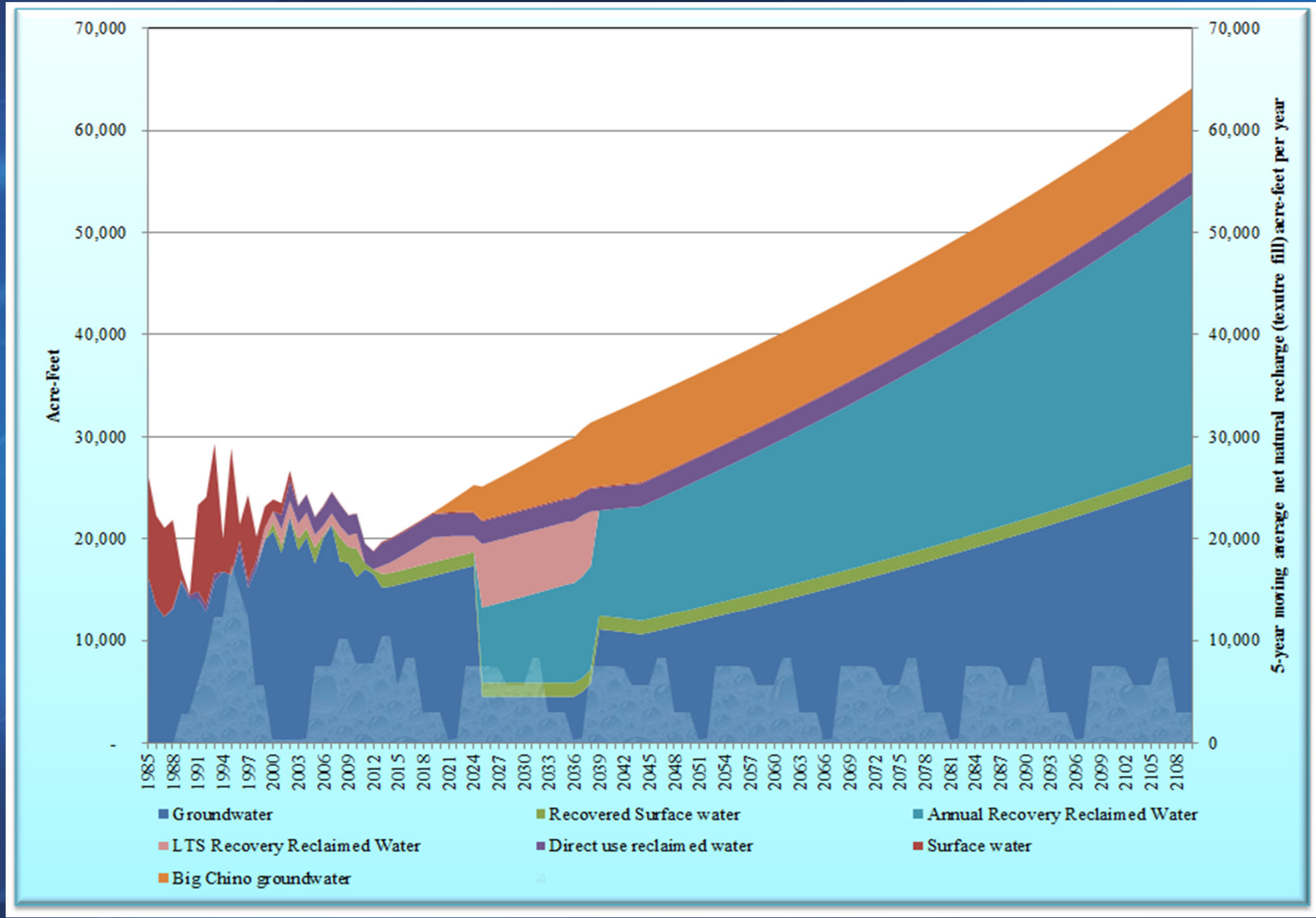
Results Scenario B - (Additional Conservation & Importation):



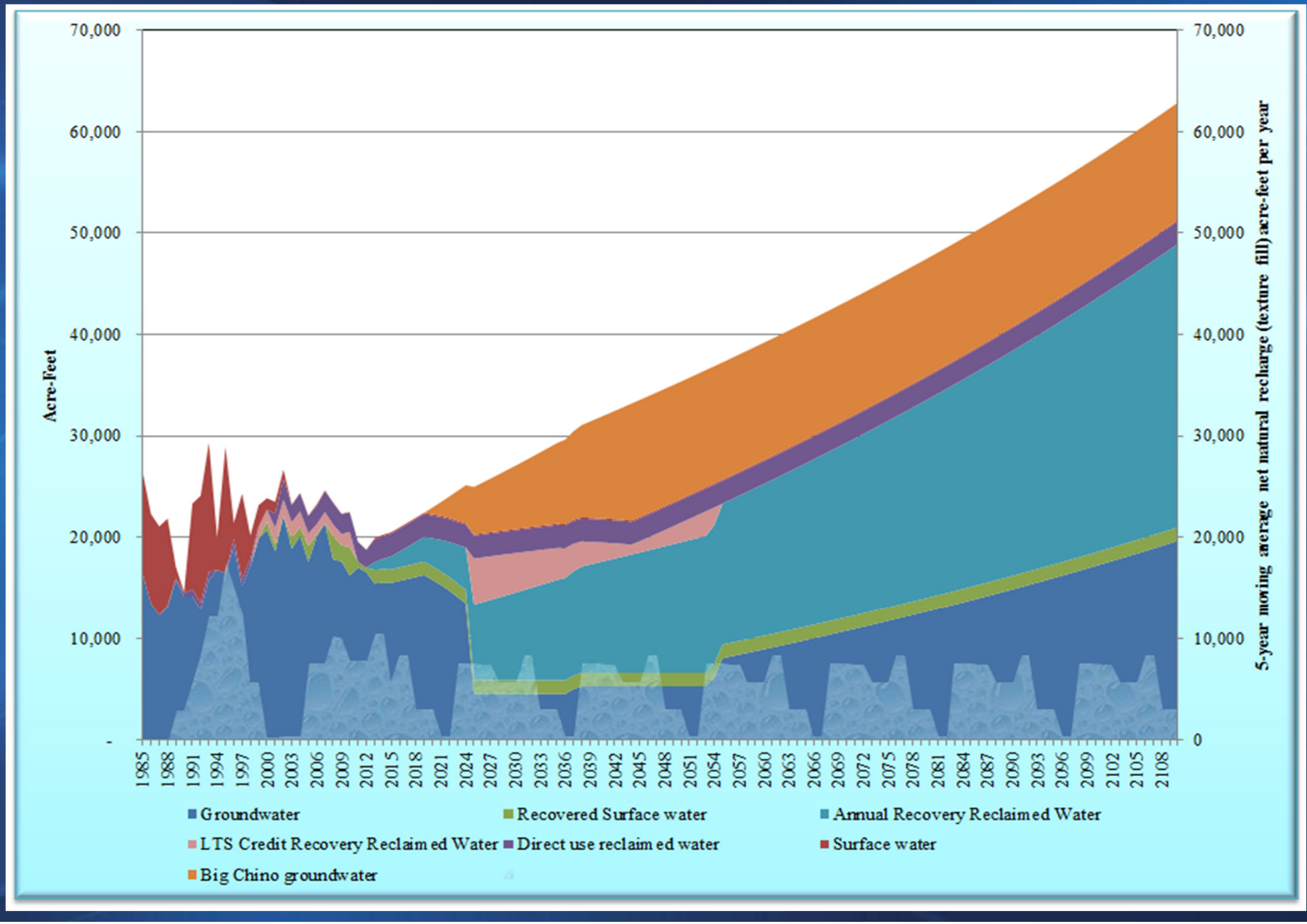
Results Scenario C – (More Conservation, Additional Importation & Additional Surface Water Supplies):



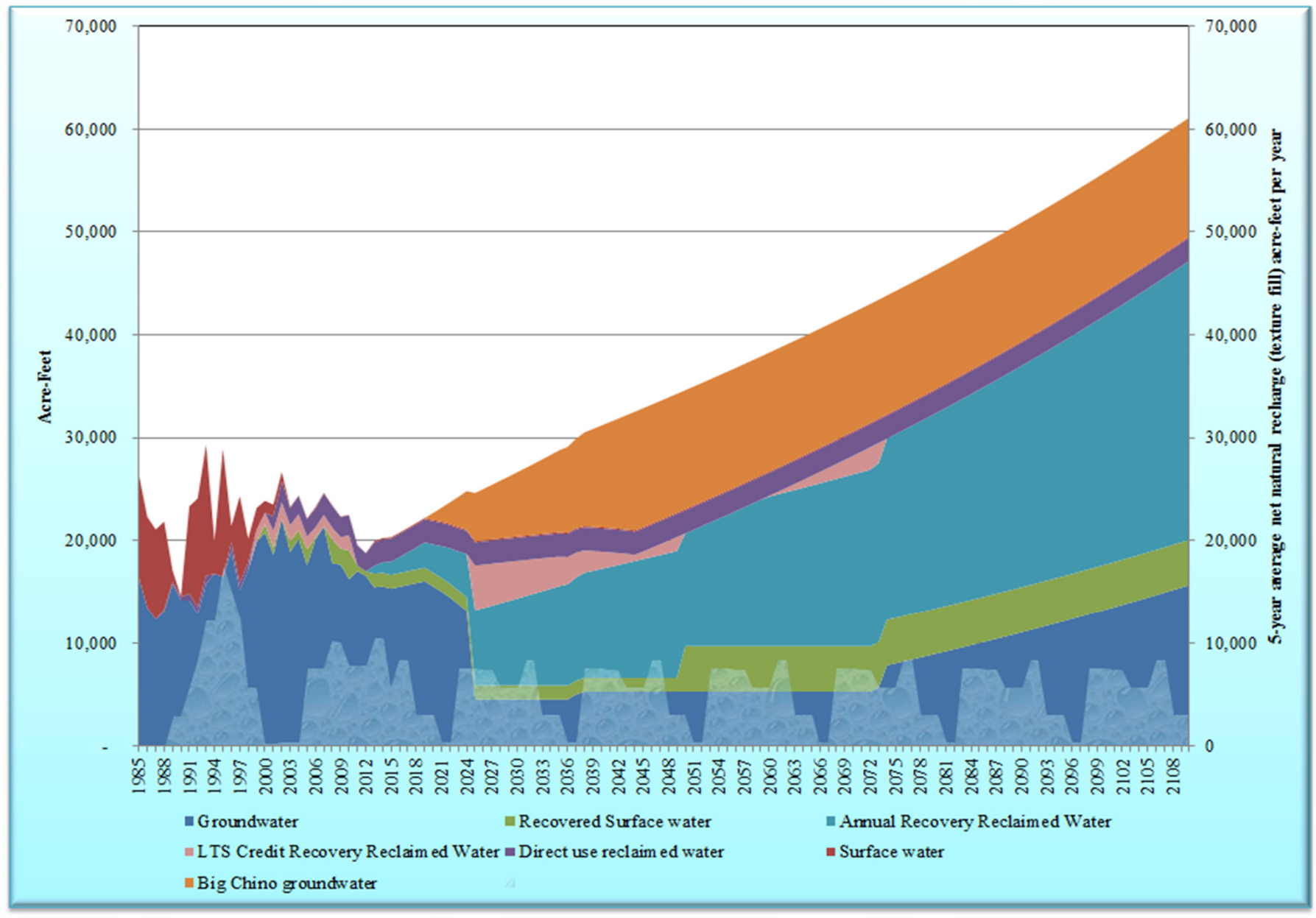
PROJECTED SUPPLIES: BASE SCENARIO



PROJECTED SUPPLIES: ADDITIONAL CONSERVATION & IMPORTATION



PROJECTED SUPPLIES: MORE CONSERVATION, ADDITIONAL IMPORTATION, AND ADDITIONAL SURFACE WATER SUPPLIES



Chapter 12: WATER MANAGEMENT STRATEGY

- Issues:
  - IGFR perpetual pumping
  - Industrial perpetual pumping/unused right
  - Platted lots without replenishment requirement (no consistency with goal)
  - Exempt wells
  - Groundwater allowance
  - Location of storage vs. location of recovery
  - Conservation alone insufficient to achieve safe-yield
  - Septic systems, lack of maximized reclaimed re-use; turf reclaimed incentive?
  - Restrictions on use of SW supplies
  - Timing and cost of imported supplies

Chapter 12: WATER MANAGEMENT STRATEGY

- Possible Solutions:
  - Construction of additional regional underground storage facilities along Granite Creek, or other area with high potential for recharge, with recovery wells located in the area of impact of storage.
  - Adoption of a seasonal/annual pumping regime to withdraw water from wells when water levels have recovered, and shift pumping to other wells when water levels are declining.
  - Increase the proportion of the AMA population on central sewer, including exempt wells; increase the capacity and/or number of wastewater treatment plants to treat the additional wastewater; increase the volume of reclaimed water stored.
  - Importation of groundwater from the Big Chino Subbasin, or other supply.

Chapter 12: WATER MANAGEMENT STRATEGY

- Possible Solutions:
  - Use more water from Watson and Willow Lakes to meet water demand and less for recreational purposes, and evaluation of surface water available from the South System from Lynx and Goldwater Lakes.
  - Pursue an allocation of CAP water, or other supply, which may be able to be used as a water exchange to allow more use from natural streams to which downstream users have senior rights/claims.
  - Adoption of more stringent conservation requirements -
    - An ordinance at the municipal or county level requiring “WaterSense” fixtures
    - An ordinance at the municipal or county level regarding landscaping

Review of PRAMA 4MP DRAFT Working Copy:

- PRAMA 4MP DRAFT Working copy
  - Supplied hard copies to GUAC members today
  - Will be posted to ADWR's website
  - ADWR is requesting written comments by September 6, 2013
  - Electronically to jmtannler@azwater.gov
  - Hard copy to Jeff Tannler, AMA Director, ADWR
- ADWR will review and summarize comments received
- September GUAC will present comments
- Promulgation will occur after ADWR makes changes to the DRAFT working copy and has Legal review the draft plan